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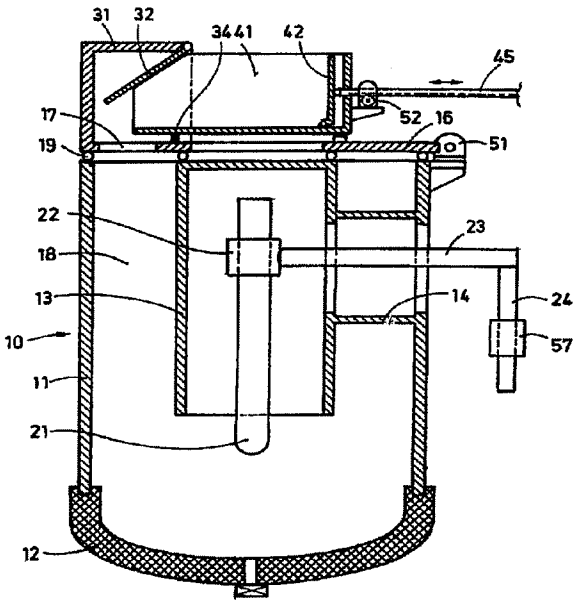
(54) Titre : PROCEDE ET DISPOSITIF PERMETTANT D'INTRODUIRE UN PRODUIT EN VRAC DANS UN RECIPIENT METALLURGIQUE

(54) Title: METHOD AND DEVICE FOR INTRODUCING BULK MATERIAL INTO A METALLURGICAL VESSEL



(57) Abrégé/Abstract:
The invention relates to a method for introducing bulk material into a metallurgical vessel, especially for introducing scrap into an arc furnace, which has at least one centrally situated electrode in an upper vessel part that is gas-tightly sealed by a lid. The bulk material is transported to the head of the metallurgical vessel in individual bulk material containers. The opening part of the bulk material container is connected to coupling parts of the lid. The bulk material is conveyed out of the container by conveying parts connected to the bulk material containers and introduced into the metallurgical vessel by access openings in the lid. In the case of a device that is suitable for carrying out this method, at least one ring-shaped part (16) of the lid (15) is rotationally connected to a lid drive system (51) in the lid plane. The rotating lid part (16) has at least one feed opening, through which the bulk material can be conveyed into the upper vessel part (11). The feed openings (16) are covered by coupling parts (31) which have a sealable wall (32). A bulk material container (41) which can be filled with bulk material can be coupled with the coupling part (31). The bulk material container (41) is connected to a conveying unit (42, 43, 44) by which means the bulk material can be conveyed into the metallurgical vessel (11) through the lid part (16), through the feed opening (17).

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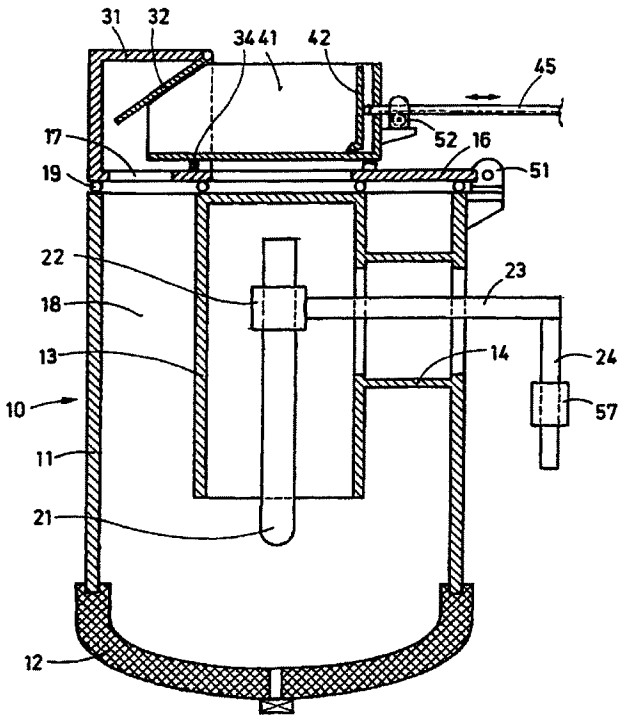
[Fortsetzung auf der nächsten Seite]

(54) Title: METHOD AND DEVICE FOR INTRODUCING BULK MATERIAL INTO A METALLURGICAL VESSEL

(54) Bezeichnung: VERFAHREN UND EINRICHTUNG ZUM EINBRINGEN VON SCHÜTTGUT IN EIN METALLURGISCHES GEFÄSS



(57) Abstract: The invention relates to a method for introducing bulk material into a metallurgical vessel, especially for introducing scrap into an arc furnace, which has at least one centrally situated electrode in an upper vessel part that is gas-tightly sealed by a lid. The bulk material is transported to the head of the metallurgical vessel in individual bulk material containers. The opening part of the bulk material container is connected to coupling parts of the lid. The bulk material is conveyed out of the container by conveying parts connected to the bulk material containers and introduced into the metallurgical vessel by access openings in the lid. In the case of a device that is suitable for carrying out this method, at least one ring-shaped part (16) of the lid (15) is rotationally connected to a lid drive system (51) in the lid plane. The rotating lid part (16) has at least one feed opening, through which the bulk material can be conveyed into the upper vessel part (11). The feed openings (16) are covered by coupling parts (31) which have a sealable wall (32). A bulk material container (41) which can be filled with bulk material can be coupled with the coupling part (31). The bulk material container (41) is connected to a conveying unit (42, 43, 44) by which means the bulk material can be conveyed into the metallurgical vessel (11) through the lid part (16), through the feed opening (17).

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Zur Erklärung der Zweibuchstaben-Codes, und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(57) Zusammenfassung: Die Erfindung betrifft ein Verfahren zum Einbringen von Schüttgut in ein metallurgisches Gefäss, insbesondere von Schrott in einen Lichtbogenofen, der in einem mit einem Deckel gasdicht verschlossenen Gefässoberteil mindestens eine zentrisch angeordnete Elektrode aufweist. Das Schüttgut wird in einzelnen Schüttgutbehältern zum Kopf des metallurgischen Gefässes transportiert. Der Mündungsteil des Schüttgutbehälters wird mit Andockteilen des Deckels verbunden. Über mit den Schüttgutbehältern verbundenen Förderteilen wird das Schüttgut aus dem Behälter gefördert und über Zugangsöffnungen im Deckel in das metallurgische Gefäss eingebracht. Bei der zur Durchführung des Verfahrens geeigneten Einrichtung ist mindestens ein ringförmiger Teil (16) des Deckels (15) in Deckelebene drehbar mit einem Deckelantrieb (51) verbunden. Der drehbare Deckelteil (16) weist mindestens eine Zugabeöffnung (17) auf, durch die Schüttgut in das Gefässoberteil (11) förderbar ist. Die Zugabeöffnungen (17) werden durch eine verschliessbare Wandung (32) besitzende Andockteile (31) abgedeckt. An dem Andockteil (31) ist ein mit Schüttgut füllbarer Schüttgutbehälter (41) andockbar. Der Schüttgutbehälter (41) ist mit einer Fördereinheit (42, 43, 44) verbunden, durch die Schüttgut durch die Zugabeöffnung (17) durch den Deckelteil (16) in das metallurgische Gefässoberteil (11) förderbar ist.

Method and Device for Introducing Bulk Material into a Metallurgical Vessel

The invention relates to a method for introducing bulk material into a metallurgical vessel, in particular, scrap metal into an electric arc furnace which has at least one centrally arranged electrode in an upper vessel part closed gas-tightly by a lid, and relative to a corresponding device.

Metallurgical vessels are conventionally filled batch-wise; for example, electric arc furnaces are usually charged by means of scrap metal baskets.

From EP 0 646 652 B1 a steel mill installation with closed, tiltable electric arc furnace is known which has a charging device with at least two storage containers. These storage containers, arranged on both sides of the electrode support arm, are fastened on the bay platform. The storage containers have a bottom which can be removed during the charging process. A continuous charging of the furnace vessel is not possible with these containers.

From DE 197 53 184 A1 a melting furnace installation for melting metals is known in which, coaxially to the main axis of the furnace, a central pipe is provided in which at least one electrode is arranged and wherein a container can be placed onto the furnace end. A charge is intermediately stored within this container above the upper furnace vessel which is closed by the lid and, by opening

the furnace lid, the charge drops into the interior of the furnace. In this known device a continuous charging of the furnaces is also not possible.

DE 44 07 861 C1 discloses a charging device for electric arc furnaces in which an annular chamber is arranged on the furnace cover wherein a drive device is arranged in the annular chamber on which switchable load magnets are suspended. At least one material feed device extends laterally into the furnace vessel, wherein load magnets fastened on the drive device are provided on the material feed device which enable a magnetic take-up of the charge material and drop thereof at any desired location within the furnace. The material feed device to the furnace is realized by endless conveyor belts. This does not represent a batch operation by means of independent bulk material containers.

It is an object of the invention to provide a method and a device for introducing bulk material into a metallurgical vessel which conveys with simple, constructive means the bulk material batchwise in an operationally safe way to the furnace end and enables a continuous charging of the bulk material into the upper vessel part.

The invention solves this object by the features of method claim 1 and of the device claim 4.

According to the invention, independent bulk material units, for example, chutes known in steel mills as they are used for the converter operation, are employed for the conveying action to the metallurgical vessel.

The lid which closes the upper vessel part of the metallurgical vessel is rotatably embodied and has at least one opening. In the area of the opening, a docking device is provided which is to be connected to the bulk material container filled with scrap metal. The bulk material is conveyed out of the container by simultaneous rotation of the lid. With this method, any point of the batch contained within the upper vessel part can be reached within an annular area of depth.

Conveying of the bulk material out of the bulk material container is controlled, either by pushing by means of a slide, by transport via a conveyor belt, or by tilting the entire container. The use of independent chutes increases the operational safety and reduces the requirements imposed on the scrap yard. Moreover, when one conveying container fails during its use on the furnace end, its function can be taken over by another container. In this connection, another container can be introduced into the charging area in place of the one that failed. Possible errors on the container, in particular, in regard to the drive of the conveying device can then be serviced in a separate maintenance area.

In addition to a slide which is driven electrically or by a fluid motor, it is also possible to use conveying devices in the form of conveying belts as well as vibrating conveyors driven in any suitable way.

In an advantageous embodiment, the bulk material container is deposited on a holding device which effects a change of the bulk material angle in the vertical and optionally in the horizontal position. With this tilting and/or pivoting unit the bulk material

container can be adjusted such that even areas in the upper furnace part which are difficult to access can be filled with bulk material. In this connection, the bulk material container itself is of a surprisingly simple configuration.

In a special configuration, a measuring and control device for detecting the filling level in the furnace end is provided wherein by means of a computing device a control of the lid rotation as well as of the removal speed of the conveying device is realized.

The bulk material containers are deposited on docking devices which by means of matching sealing strips, ensure an environmentally friendly charging of the metallurgical vessel. In an advantageous further embodiment of the invention, this sealing device is supported to be springy.

According to the invention, the individual bulk material containers can be docked in any suitable position on the lid.

According to a first embodiment, the bulk material container is positioned diagonally on the circular lid wherein the bulk material container does not project past the lid rim during charging.

In a second embodiment only the noses of the bulk material containers extend to the lid while a large portion of the container surface projects past the lid rim. In this configuration, significantly more than only one container can be docked on the furnace end. In this connection, it is beneficial to have at least two docking units because in this way an uninterrupted continuous charging is possible.

In a further advantageous configuration it is provided that at least three bulk material containers are to be docked on the furnace end, wherein the individual containers are guided on a line which is guided tangentially to the centerline of the feed openings. In this way, the individual containers project hardly past the lid rim and still allow a continuous filling of the metallurgical vessel, even when one bulk material container breaks down.

One embodiment of the invention is illustrated in the attached drawings. It is shown in a schematic illustration in

Fig. 1 a furnace vessel with a bulk material container arranged on the rotatable lid;

Fig. 2 a furnace with two outwardly projecting bulk material containers;

Fig. 3 an electric arc furnace with a docking station;

Figs. 4a-4c plan views onto the furnace vessel with the arrangement of the bulk material containers, at a reduced scale.

Figs. 1 through 3 show metallurgical vessels, respectively, here in the form of electric arc furnaces with a bottom vessel part 12 and an upper vessel part covered by lid 15. The lid 15 or an annular lid part 16 is rotatably supported by means of rollers 19 on the mouth of the upper vessel part 11 and is driven by a rotary lid drive 51.

In Figs. 1 and 2 a sleeve 13 is provided concentrically to the upper vessel part 11 in which an electrode 21 is arranged.

In Fig. 1, the electrode is in a sleeve 13 which can be closed in direction toward the mouth of the upper vessel part 11 wherein the electrode 21 is connected by means of an electrode holder 22 on a support arm 23 which is connected with a support column 24 that is vertically movable by means of an electrode drive 57. The sleeve 13 is fastened by means of a sleeve holder 14 on the upper vessel part 11.

An annular lid part 16 is rotatably supported on lid bearings 19 on the mouth of the sleeve 13 as well as on the mouth of the upper vessel part 11. The lid part 16 has a feed opening 17. In this area a docking station 31 is provided with a closeable wall 32, embodied as a flap in this embodiment.

On the docking station 31 a bulk material container 41 can be docked. In order to prevent dust-containing gas from exiting, a sealing strip 34 is provided on the docking station 31 for sealing relative to the container 41.

On the bulk material container 41 a motor 52 is arranged on the exterior which cooperates with a drive rod 45 connected to a slide 42. The bulk material can be moved with this slide 42 in a predetermined way in the direction to the mouth of the bulk material container 41 and can be conveyed continuously into the charging space 18 of the upper vessel part 11.

In Fig. 2, the electrode is secured on the mouth of the sleeve 13, facing the bottom vessel part 12, by means of an electrode holder 22.

The annular charging space 18 is closed at its opening by an annular lid part 16. The annular lid part 16 is rotatable by means of the lid bearing 19 and can be driven by the rotary drive 51 . Feed openings 17 are provided in the annular lid part 16. In the right part the feed opening 17 is covered by a docking part 31 which has a closeable wall (louver 32).

The bulk material container 41 is deposited in a tilting conveying device 44 which tilts by means of a tilting drive 53 the bulk material container 41 or pivots the bulk material container relative to the horizontal alignment by means of the pivot drive 56.

In the case of tilting as well as pivoting, the closeable wall 32 has shaped elements 33 which ensure a gas-tight sealing between the docking part 31 and the forward part of the bulk material container 41.

On the left side, the bulk material container 41 has a transport conveying device 43 in the bottom area which can be driven by a conveyor belt motor 54. The lower run of the conveyor belt is arranged outside of the bulk material container 41 which is configured as a chute in this case.

The transport conveying device 43 communicates by means of a measuring and control unit 62 with the filling level measuring device 61 provided in the upper vessel part 11.

Moreover, the bulk material container 41 in the present case is covered by a cover hood 47. The cover hood 47 projects with a size corresponding to the feed opening 17 of the annular lid part 16 past the nose of the bulk material container 41.

In the configuration of the bulk material container 41 illustrated here the docking station is configured as a simple feed opening 17 which can be closed by a lid 35.

In Fig. 2 both bulk material containers 41 project significantly past the lid part 16. The support required in this connection within the steel mill bay is not illustrated.

In Fig. 3, the electrode 21 is fastened by means of a holder 22 on the support arm 23 which is vertically drivable by a drive 57.

In the electric arc furnace illustrated here, the complete lid 15 is supported on the lid bearing 19 and driven by the drive 51. In the right upper part, the front view of a docking station 31 is illustrated which by means of an adjustable wall 32, here in the form of a louver, is movable by a drive 55.

Fig. 3 illustrates clearly that the docking station 31 has a certain height so that the docking station 31 and the possibly docked bulk material container 41 can be guided underneath the support arm 23 without being hindered.

In Figs. 4a to 4c plan views onto the lid 15 are illustrated. In this connection, Fig. 4a) shows a bulk material container 41 which is guided transversely across the lid 15 and is docked on the docking station 31 above the optionally arranged sleeve 13.

In Fig. 4b) two docking stations 31, each with one bulk material container 41, are illustrated. In the right part of Fig. 4b) it is illustrated that the bulk material container not only can be moved in and out and, in this way, can be docked on the docking station 31, but it can also be pivoted and tilted.

In Fig. 4c) the individual bulk material containers 41 are connected to the docking stations 31 such that the bulk material containers 41 are arranged centrally on a straight line G wherein the straight line G extends tangentially to a centerline which is guided through the feed openings 17.

List of Elements

10	metallurgical furnace vessel
11	upper vessel part
12	bottom vessel part
13	sleeve
14	sleeve holder
15	lid
16	annular lid part
17	feed opening
18	charging space
19	lid bearing/rollers

Electric Parts

21	electrode
22	electrode holder
23	support arm
24	support column

Docking

31	docking station
32	closeable wall/louver
33	shaped element
34	sealing strip
35	feed opening of the lid

Conveying

41	bulk material container
42	sliding conveying device/slide
43	transport conveying unit
44	tilting conveying unit

45	drive rod
46	tilting and/or pivoting unit
47	cover hood
M	centerline
G	straight line

Drive

51	rotary lid drive
52	slide drive - bulk material container, motor
53	tilting drive - bulk material container
54	conveyor belt - bulk material container, motor
55	louver motor
56	pivot drive - bulk material container
57	electrode drive

Filling Level

61	filling level measuring device
62	measuring and control unit

Claims

1. Method for introducing bulk material into a metallurgical vessel (10), in particular, scrap metal into an electric arc furnace which has at least one centrally arranged electrode (21) in an upper vessel part (11) closed gas-tightly by a lid (15),
wherein the bulk material is transported in individual bulk material containers (41) having mouth parts to the end of the metallurgical vessel (10)
and the mouth part of the bulk material container is connected to docking parts (31) of the lid (15),
characterized in that
by means of conveying units (42, 43, 44) connected to the bulk material containers, which move the bulk material in the direction mouth part of the bulk material container (41), the bulk material is moved out of the bulk material container; and that the bulk material is introduced via feed openings (17) in the lid (15), covered by means of the docking parts (31), into the metallurgical vessel (10) by simultaneous rotation of at least one annular part (16) of the lid (15).
2. Method according to claim 1,
characterized in that
the bulk material is pushed out of the bulk material container.

3. Method according to claim 1,
characterized in that
the bulk material angle of the bulk material conveyed into the metallurgical vessel is predetermined by control of the position of the bulk material container.